GURU NANAK INSTITUTE OF TECHNOLOGY

An Autonomous Institute under MAKAUT

2020-2021

ANALOG ELECTRONIC CIRCUITS

EI301

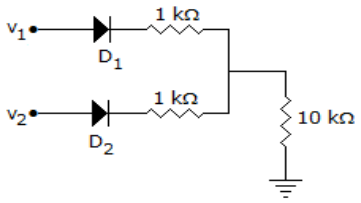
TIME ALLOTTED: 3 HOURS **FULL MARKS: 70**

The figures in the margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable

GROUP – A
(Multiple Choice Type Questions)

Answer any ***ten*** from the following, choosing the correct alternative of each question: **10×1=10**

			Marks	CO No
1.	(i)	An ideal op-amp has CMRR and slew rate respectively a) infinity and infinity b) zero and infinity c) zero and zero d) infinity and zero.	1	CO1
	(ii)	In an amplifier a coupling capacitor is used to a) Match the impedance b) Control frequency c) Limit bandwidth d) Prevent DC mixing with the output	1	CO1, CO2
	(iii)	A differential amplifier is used at input stage of any operational amplifier to ensure a) High CMRR b) Wide Bandwidth c) High slew rate d) High open loop gain	1	CO1,CO3
	(iv)	A V-I converter is a / an a) Transconductance amplifier b) Transresistance Amplifier c) Current Amplifier d) Operational Amplifier	1	CO1, CO2
	(v)	Output pulse width for a monostable multivibrator using IC 555 where external resistance and capacitance are 20 KΩ and 0.1 μF is a) 2.1 s b) 2.2ms c) 2.5 s d) 2.2 μs	1	CO1,CO4

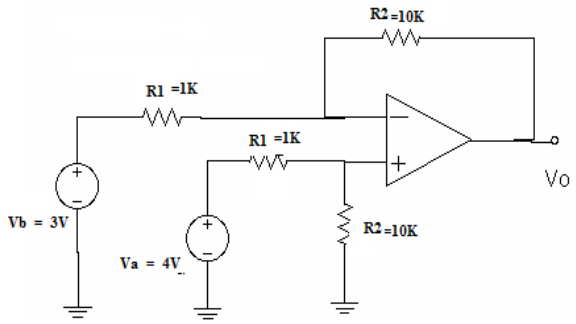
(vi)	The gain required for the sustained oscillation in Wien Bridge oscillator is a) 29 b) 1.5 c) 3 d) 1	1	CO1,CO3
(vii)	A differential amplifier has the differential gain of 100,If its CMRR=240,then the common mode gain is a) 0.24 b) 24000 c) 0.417 d) 1	1	CO1,CO2
(viii)	Schmitt trigger is also known as a) squaring circuit b) blocking oscillator c) sweep circuit d) astable multivibrator.	1	CO3
(ix)	For a wide range of oscillations in the audio range, the preferred oscillator is a) Hartley b) Phase shift c) Wien bridge d) Hartley and Colpitt.	1	CO2
(x)	In the figure below v1 = 8 V and v2 = 4 V. Which diode will conduct?  a) D2 only b) D1 only c) Both D1 and D2 d) Neither D1 nor D2	1	CO2
(xi)	The voltage gain of an emitter follower circuit is a) greater than 1 b) equal to 1 c)less than 1 d) none of these	1	CO1,CO3

GROUP – B
(Short Answer Type Questions)

Answer any ***three*** from the following: **3×5=15**

			Marks	**CO No**
2.	(a)	Why a voltage divider bias circuit is known as self-bias circuit?	2	CO2

	(b)	A silicon transistor with $\beta = 50$, $V_{BE} = 0.6V$, VCC = 22.5 V and R_C =5.6 K is used for self-biasing circuit. It is desired to establish a Q point at V_{CE} = 12 V. I_C = 1.5 mA and stability factor S ≤ 3. Find R_E, R_1 and R_2(The symbols have their usual meanings).	3	CO2,CO4
3.	(a)	Explain how the bandwidth of an amplifier will be increased using negative feedback	2	CO1,CO2, CO3
	(b)	Prove that the gain of the amplifier used in a Wien bridge oscillator must be greater than 3 for sustained oscillations	3	CO1,CO2, CO3
4.	(a)	Why a voltage divider bias circuit is known as self-bias circuit?	2	CO2,CO3
	(b)	A silicon transistor with $\beta = 50$, $V_{BE} = 0.6V$, $V_{CC} = 22.5$ V and R_C =5.6 K is used for self-biasing circuit. It is desired to establish a Q point at V_{CE} = 12 V. I_C = 1.5 mA and stability factor S ≤ 3. Find R_E , R_1 and R_2(The symbols have their usual meanings).	3	CO2,CO3
5.	(a)	For the following circuit find the output voltage using the data given as following.	5	CO1,CO4

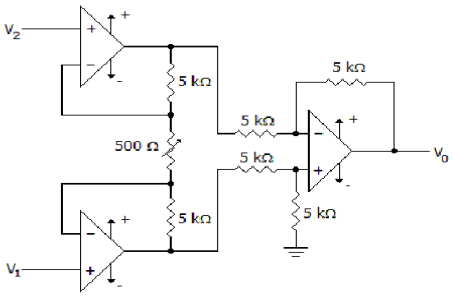


6.	(a)	Find out the condition of an astable multivibrator so that its duty cycle would be less than 50% and draw the circuit diagram	5	CO3

GROUP – C
(Long Answer Type Questions)

Answer any ***three*** from the following: **3×15=45**

			Marks	**CO No**
7.	(a)	Explain how it is possible to achieve better Q-point stabilization by using self-bias circuit.	4	CO2,CO3
	(b)	Consider a self bias circuit with an npn silicon transistor CE configuration. The circuit is designed in such a way that the I_C = 1·5 mA, V_{CE} = 10 V and the stability factor is less than equal to 6. If V_{CC} = 20V, V_{BE} = 0·7 V, B = 100, RC = 5K, calculate the values of R_E , R_1 , R_2	7	CO2,CO3
	(c)	How the operating point of a transistor can shift ? How will you define the stability factors for a transistor ?	4	CO2,CO3
8.	(a)	What is free running oscillator? Derive the expression for time period.	4	CO2,CO3

	(b)	How can the duty cycle be 50% by adding diode?	4	CO2,CO3
	(c)	For a astable multi-vibrator using 555 timer R_A = 6.8 K , R_B = 3.3 K and C = 0.1 F, calculate (i) t_{HIGH} (ii) t_{LOW} (iii) free running frequency (iv) duty cycle,	7	CO2,CO3
9.	(a)	 Calculate the output voltage for V_1=5V and V_2=2.5V	5	CO1,CO4
	(b)	Draw the output waveforms if input of a differentiator is i) Triangular wave ii) Square wave	5	CO2,CO4
	(c)	Explain the monostable operation of NE555 with proper circuit diagram and waveform.	5	CO2,CO4
10.	(a)	What is crossover distortion in Class B amplifier and how can it be removed.	4	CO3
	(b)	Draw the h-parameter equivalent circuit of low frequency CE mode transistor amplifier and hence calculate the current gain , Voltage gain,I/P impedance & O/P impedance in terms of h-parameters	7	CO2,CO3
	(c)	With a proper circuit diagram, explain the operation of phase shift oscillator circuit.	4	CO4
11.	(a)	Design Schmitt trigger circuit using Op-amp which has a maximum output voltage +10V and -10V.The hysteresis V_H should be 0.4V.Explain the working of the circuit with the transfer characteristics .Use a reference voltage V_R=2V	10	CO2,CO4
	(b)	With reference to Schmitt Trigger using Op-Amp,define UTP and LTP,Explain why hysteresis is introduced in Schmitt Trigger	5	CO2,CO4